In re Patent Application of:
LEVINE ET AL.
Serial No. **09/656,393**
Filing Date: **9/6/2000**
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REMARKS

Claims 1-21 and 26-43 remain in this application. Claims 22-25 have been cancelled. Claims 1, 18, 26 and 43 have been amended. Claims 7, 9-12, 19-21, 32, 34-37, 42 and 46 have been previously amended.

Applicants thank the Examiner for the detailed study of the application and prior art.

The Examiner has again applied U.S. Patent No. 5,943,652 to Sisley et al. (hereinafter "Sisley") to reject most claims as anticipated while applying Sisley in view of U.S. Patent No. 5,873,124 to Draves to reject claims 3 and 28. Claims 11 and 36 are considered obvious over Sisley alone.

Applicants also file a Request for Continued Examination to have this After Final Amendment entered.

This application is now placed in condition for allowance.

Applicants stress that the claimed invention as now presented in this Amendment is more than a simple resource assignment and scheduling system for workers that uses a modified "best-first" search technique that combines some optimization and artificial intelligence to arrive at near-optimal assignment and scheduling solutions as in Sisley. Although Sisley may show the use of pruning heuristics to avoid the necessity of a full-scale scheduling operation and reduce potential schedules, Sisley is still specifically directed to the use of a single algorithm that produces a least-stress schedule with a type of one-size-fits-all algorithm to solve problems in scheduling. The algorithm is explained for use with a search space relative to column 7

starting at line 57 through column 8 at line 14, and at column 22 at line 24 through line 58 as follows:

> "The search operation of A/S system 12 will now be described. In response to an SMS or field event received at queue 20, the A/S system 12 conducts a modified "best-first" search that combines optimization, artificial intelligence, and constraint-processing techniques to arrive at near-optimal assignment and scheduling recommendations. When a change to the technician or call set is received, the A/S system 12 executes a search that evaluates potential changes to the existing assignment set in an attempt to find a better distribution of calls among the technicians, as well as a better scheduling of calls assigned to individual technicians. The A/S system 12 generates assignment and scheduling recommendations for all new calls as they are received, and immediately readjusts the assignment, resulting in global optimization. However, each search operation conducted by A/S system 12 explores the effects of only an incremental change to the call set such as adding a new call, removing a pending call, or reassigning a pending call. Thus, the search technique assumes that the existing assignment set is already optimized, and limits the task only to minimizing the effects of the incremental change, thereby reducing the search space. The A/S system 12 also incorporates domain constraints into the search to further prune the search space."

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> "The first and second pruning heuristics will be described with reference to FIGS. 6 and 7. The first pruning heuristic is herein referred to as "caching," whereby the scheduler module 24 avoids the redundant generation of potential schedules that have already been generated. In response to the addition of a call, the removal

> of a call, or a request for reevaluation, as indicated by block 140 in the flow diagram of FIG. 6, the scheduler module 24 must generate a least-stress schedule of the set of calls passed by assigner module 22 for a particular technician. Before generating any potential schedules, however, the scheduler module 24 searches a plurality of schedules stored, or "cached," in a schedule buffer associated with the scheduler module 24. The schedules stored in the schedule buffer represent "best" schedules generated in previous runs of the scheduler module 24. The schedule buffer stores each schedule with its corresponding schedule stress value, as determined previously by the scheduler module 24. The scheduler module 24 maintains the contents of the schedule buffer for a predetermined amount of time for future reference. The scheduler module 24 accesses the schedule buffer in an attempt to find a "non-obsolete," matching schedule previously generated for the same set of calls and the same technician passed by the assigner module 22, as indicated by block 142. A schedule is "non-obsolete" if a better schedule has not been generated in a subsequent run of the scheduler module 24, and if a significant amount of time has not passed. The matching schedule represents a time-ordered sequence for an identical assignment of calls to the same technician under evaluation. If a matching schedule is located, the scheduler module 24 simply selects that schedule as the best schedule for the particular technician and returns it to the assigner module 22 with the corresponding schedule stress value, as indicated by branch 144 and block 146. Thus, the caching technique avoids performing the same scheduling work more than once."

The claimed invention presented in this After Final Amendment does more than apply some type of least-stress

algorithm to obtain a "best" schedule based upon a best first search as in Sisley. The claimed invention schedules mobile workers for the tasks to be performed on target objects by running a rule engine to determine algorithms that are based on a utility function for partitioned jobs and workers. Different algorithms can be selected and used for different partitions to schedule jobs and workers in selected different regions. Thus, partitioning occurs as set forth on page 24 of the application and explained further through and up to page 27 in which an assignment of an algorithm and parameters can be applied to each region in which partitioning of the problem space has occurred by dividing it into "regions" as defined by the number of workers and number of jobs for that region.

Selected algorithms are used to schedule each partition and a set of schedules for all jobs and all work schedules occurs. Some of the algorithms could use different utility functions and could lead to different results. Thus, the utility function can be used as a parameter to set an algorithm based on the characteristics of the problem space and different algorithms could be used depending on the partition. A brute force algorithm could be used first since it is a simple algorithm that tries examples by "brute force." If there are many possible jobs and workers, then a more sophisticated algorithm is used if the partition demands it.

Sisley nowhere discloses or suggests such partitioning and algorithm selection based on the utility function and the partitions and regions. Sisley conducts a single algorithm best first search followed by some caching and the use of the same algorithm to obtain a least-stress

schedule for the best schedules. There is no partitioning and no suggestion or motivation to do such function in Sisley.

It should be understood that there is a limited amount of time for scheduling in a complex institution with many workers and potential jobs. The use of partitioning as claimed speeds the process and can provide greater control, for example, allowing one site to be quickly analyzed by a brute force algorithm and other partitioned regions to be analyzed by different algorithms. The brute force algorithm could work well at a site having a fewer number of workers and jobs as compared to using a more sophisticated algorithm in another partitioned region that demands another different algorithm after it has been determined that a brute force algorithm may not work.

Also, as claimed in this After Final Amendment, the simulator module and simulator database are recited. Data can be copied from the database for target objects such that the simulator module queries the simulator database for data to determine the effects of a policy change on planning and scheduling jobs and workers by running the simulator module. This can occur in real time even as real time scheduling in the real world is occurring. Of course, the same algorithms as used in the real world and can be applied in the simulation world. The different agents can operate in the real world and in the simulated world at once to make the process transparent. The simulator module also works in conjunction with the event bus as an event driven architecture since the data has been copied from the database for target objects and the different agents would operate in the simulation module in conjunction with the event bus.

Sisley nowhere discloses or suggests any simulator module and simulator database with the function and methodology as presented in this After Final Amendment.

Draves is directed to the use of virtual memory within a protected operating system kernel function by passing a virtual memory address to an executable program component, and during the access, detecting when the virtual memory address is invalid. In response, it maps the invalid virtual memory address to a scratch location in physical memory. Any handheld communication in Draves as part of the computer system does not suggest the claimed invention in combination with Sisley as now set forth in this After Final Amendment.

Applicants contend that the present case is in condition for allowance and respectfully requests that the Examiner issue a Notice of Allowance and Issue Fee Due. If the Examiner has any questions or suggestions for placing this case in condition for allowance, the undersigned attorney would appreciate a telephone call.

Respectfully submitted,

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Julie Lalan